

**An update from the Department of Education on:**

**“Analyses of Economic, Environmental,  
and Occupant Benefits of Sustainable  
Design and LEED® Certification for  
State of Hawaii and K-12 Public School  
Facilities”**

**A report prepared for DBEDT by  
Ferraro Choi and Associates, Ltd.  
in collaboration with Lincolne Scott, Inc.,  
RMI/ENSAR Built Environment,  
and O’Brien & Company**

**4 studies within the report**

- 1. Economic and Environmental Benefits of Sustainable Design for State of Hawaii New Elementary Schools**
- 2. Case Study: Waipahu Intermediate Cafeteria**
- 3. Theoretical Case Study: Retrofit of an Existing non-air conditioned classroom building**
- 4. Implementation, Research and Strategies**

## **1 – Economic & Environmental Benefits: “Green” vs Conventional Elementary School**

- Defined and modeled a conventional DOE elementary school as a Base Case. Then modified costs and performance to represent a Green Case and compared capital and life cycle costs for each in Net Present Value.
- Created an on-line survey of 12 existing sustainable schools in order to determine if they have experienced economic benefits. (9 on mainland and 3 in Hawaii)

## **1 – Economic & Environmental Benefits: Findings & Conclusions:**

- Budgeting for elementary schools should include added costs for construction, special AE design services, commissioning, and LEED® certification. These costs are more than offset over the life of a school facility. Report indicates 2.5% increase.
  - Construction: 1.5%
  - Commissioning: 0.25%
  - LEED Certification: 0.25%
  - Special AE Design: 0.5%
- The single most important strategy in achieving economic benefits (operational savings) is daylighting.

## **1 – Economic & Environmental Benefits: Findings & Conclusions:**

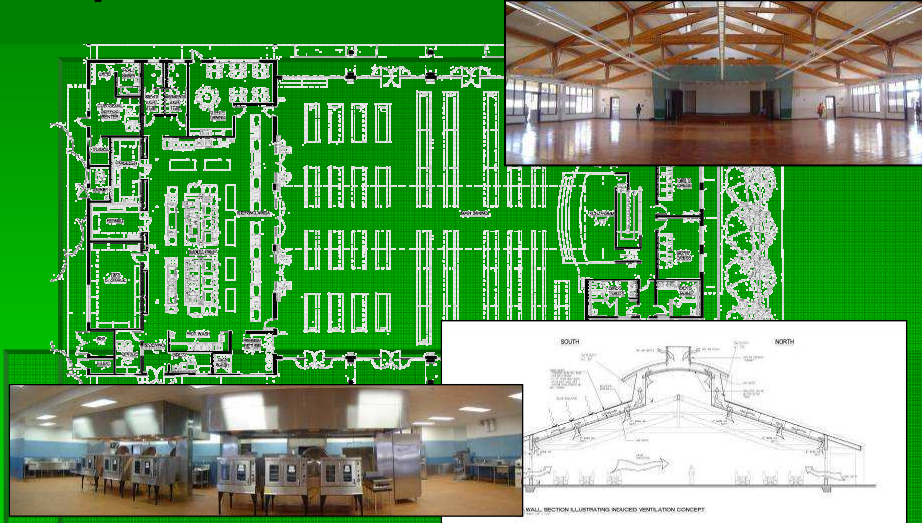
- **Electricity Is the largest Utility Cost**
  - Building Orientation and Envelope Design
    - Reduces External Heat Gain
  - Daylighting
    - Reduces Internal Heat Gain
    - Reduces the need for artificial lighting
  - Energy Efficient Air Conditioning Equipment
    - Further reduces energy consumption

## **1 – Economic & Environmental Benefits: Findings & Conclusions:**

- LEED® Silver is feasible; critical to achieve a minimum of 6 credits in “Optimize Energy Performance” category (30% reduced consumption = operational savings)
- Trends in sustainable design strategies determined by the on-line survey of 12 sustainable schools include: daylighting, energy conservation, water conservation, use of materials with recycled content, diverting construction waste from landfill, and superior ventilation.



## 2 – Case Study: Waipahu Intermediate School Cafeteria



## 2 – Case Study: Waipahu Intermediate School Cafeteria Findings & Conclusions:

- WIS is the 1st LEED® certified project for the DOE and a successful example of economic, and environmental benefits that are achieved with sustainable design.
- LCCA of WIS indicates that the NPV is lower than a conventional cafeteria, but only slightly so due to energy intensive requirements. Maximizing daylight and passive ventilation allows an approx. savings of \$3,000 per year (15% savings)
- WIS has achieved a number of occupant and environmental benefits including thermal comfort, superior ventilation, use of construction materials with recycled content, use of locally manufactured materials and diversion of 85% of construction materials from landfill.

### **3 – Retrofit of an Existing Classroom Bldg. Campbell High School**



### **3 – Retrofit of an Existing Classroom Bldg. Findings & Conclusions:**

- Passive design solutions to achieve heat abatement for existing classrooms will likely have limited application and success in improving thermal comfort. Air Conditioning with Variable Refrigerant Technology (VRT) may be the most energy efficient solution.
- Providing heat abatement with air-conditioning will provide thermal comfort but will increase school operating costs and, although the study did not address renewables, providing energy from a renewable source should be explored.



## 4 – Implementation Research & Strategies

- Analysis of existing Department of Education/State of Hawaii processes for planning & budgeting of Capital Improvement Projects.
- Looked at possible improvements to:
  - Project Funding
  - Consultant Selection
  - Facility Planning
  - Special Funding
  - Transitioning

## 4 – Implementation Research & Strategies

### Findings & Conclusions:

- Prioritize architectural and technological design strategies to achieve a 30% reduction in operational expenses.
- Establish a uniform process for monitoring & accounting for energy and water consumption.
- Employ life cycle cost analysis as a primary decision making tool
- Fund capital projects to allow for integrated design and equipment upgrades.
- Modify the consultant selection process to ensure expertise in sustainable design.

## **4 – Implementation Research & Strategies**

### **Findings & Conclusions:**

- Modify the facility planning process to ensure decision-making takes sustainable design goals into account.
- Set minimum requirements for the design of new schools and major renovations.
- Establish a clear certification path for K-12 schools
- Provide training to enable successful implementation.
- Phase implementation to increase opportunity for success.

### **Next Steps**

#### **How we will use the study**

- Share with the Legislature when seeking additional funding/personnel.
- Use as a planning document for continuing to develop the DOE's Energy Plan.
- Implement recommendations with further assistance from DBEDT

**Thank you**